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Basic Concepts

... economics is not an exact science: it consists merely, of Laws of Probability. The most prudent investor therefore, is one who pursues only a general course of action which is "normally" right and who avoids acts and policies which are normally wrong.

L.L.B. Angas

There will come a time when we no longer will know how to do the calculation for long division, because miniature voiceactivated computers will be everywhere. We might not even need to be able to add; it will all be done for us. We will just assume that it is correct, because computers don't make mistakes. In a small way this is happening now. Not everyone checks their more complicated spreadsheet calculations by hand to be certain they are correct before going further. Nor does everyone print the intermediate results of computer calculations to verify their accuracy. Computers don't make mistakes, but people do.

With computer software rapidly making technical analysis easier, we no longer think of the steps involved in a moving average or linear regression. A few years ago we used correlations only when absolutely necessary, because they were too complicated and time consuming to calculate. It would even be difficult to know if you had made a mistake without having someone else repeat the same calculations. "sc" we face a different problem if the computer does it all, we lose our understanding of why 1, a moving average trendline differs from a linear regression. Without looking at the data, we don't see an erroneous outlier. By not reviewing each hypothetical trade, we miss seeing that the slip page can turn a profit into a loss.

To avoid losing the edge needed to create a profitable trading strategy, the basic tools of the trade are explained in this chapter. Those of you already familiar with these methods may skip over it; others should consider it essential that they be able to perform these calculations manually.

ABOUT DATA AND AVERAGING

The Law of Averages

The law of averages is a greatly misunderstood and misquoted principle. Its most often referred to when an abnormally long series of losses is expected to be offset by an equal and opposite run of profits. It is equally wrong to expect a market that is currently overbought to next become oversold. That is not what is meant by the law of averages. Over a large sample, the bulk of events will be scattered close to the average in such a way as to overwhelm an abnormal set of events and cause them to be insignificant.

This principle is illustrated in Figure 21, where the addition of a small abnormal grouping to one side of a balanced group of nearnormal data does not affect the balance. A long run of profits, losses, or price movement is simply abnormal and will be offset over

time by the large number of normal events. Further discussion can be found

in "The Theory of Runs" (Chapter 22).

Bias in Data

When sampling is used to obtain data, it is common to divide entire subsets of data into discrete parts and attempt a representative sampling of each portion. These samples are then weighted to reflect the perceived impact of each part on the whole. Such a weighting will magnify or reduce the errors in each of the discrete sections. The result of such weighting may cause an error in bias. Even large numbers within a sample cannot overcome intentional bias introduced by weighting one or more parts.

Price analysis and trading techniques often introduce bias in both implicit and explicit ways. A weighted average is an overt way of adding a positive bias (positive because it is intentional). On the other hand, the use of two analytic methods acting together may unknowingly rely doubly on one statistical aspect of the data; at the same time, other data may be used only once or may be eliminated by offsetting use. The daily high and low used in one part of a program and the daily range (high to low) in another section would introduce bias.

How Much Data Is Enough?

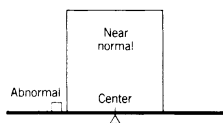
Technical analysis is fortunate to be based on a perfect set of data. Each price that is recorded by the exchange is exact and reflects the netting out of all information at that moment. Most other statistical data, although it might appear to be very specific, are normally an average value, which can represent a broad range of numbers, all of them either larger or smaller. The average price received by all farmers for corn on the 15th of the month cannot be the exact number. The price of Eurodollars at 10:05 in Chicago is the exact and only price.

When an average is used, it is necessary to collect enough data to make that average accurate. Because much statistical data is gathered by sampling, particular care is given to accumulating a sufficient amount of representative data. This will hold true with prices as well. Averaging a few prices, or analyzing small market moves, will show more erratic results. It is difficult to draw an accurate picture from a very small sample.

When using small, incomplete, or representative sets of data, the approximate error, or accuracy, of the sample should be known. This can be found by using the standard deviation as discussed in the previous section. A large standard deviation means an extremely scattered set of points, which in turn makes the average less representative of the data. This process is called the testing of significance. The most basic of these tests is the error resulting from a small amount of data. Accuracy usually increases as the number of items becomes larger, and the measurement of deviation or error will become proportionately smaller.

$$\text{Error} = \frac{1}{\sqrt{\text{number of items sampled}}} = \frac{1}{\sqrt{N}} \text{ or } 1/\sqrt{N}$$

FIGURE 21 The law of averages. The normal cases overwhelm the unusual ones. It is not necessary for the extreme cases to alternate one higher, then the other lower to create a balance.



Therefore, using only one item has an error factor of 100%; with four items, the error is 50%. The size of the error is important to the reliability of any trading system. If a system has had only 4 trades, whether profits or losses, it is very difficult to draw any conclusions about performance expectations. There must be sufficient trades to assure a comfortably small error factor. To reduce the error to 5%, there must be 400 trades, which presents a dilemma for a very slow trendfollowing method that may only generate 2 or 3 trades each year. To compensate for this, the identical method can be applied to many markets and the sample of trades used collectively. By keeping the sample error small, the risk of trading can be better understood.

ON THE AVERAGE

In discussing numbers, it is often necessary to use representative values. The range of values or the average may be substituted to change a single price into a general characteristic to solve a problem. The average (arithmetic mean) of many values can be a preferable substitute for any one value. For example, the average retail price of one pound of coffee in the northeast is more meaningful to a costofliving calculation than the price at any one store. However, not all data can be combined or averaged and still have meaning. The average of all futures prices taken on the same day would not say anything about an individual market that was part of the average. The price changes in copper, corn, and the German DAX index, for example, would have little to do with one another. The average of a group of values must meaningfully represent the individual items.

The average can be misleading in other ways. Consider coffee, which rose from 40c to \$2.00 per pound in one year. The average price of this product may appear to be \$1.40; however, this would not account for the time that coffee spent at various price levels. Table 21 divides the coffee move into four equal price intervals, then shows that the time intervals spent at these levels were uniformly opposite to the price rise. That is, price remained at lower levels longer, and at higher levels for shorter time periods, which is very normal price behavior.

When the time spent at each price level is included, it can be seen that the average price should be lower than \$1.40. One way to calculate this, knowing the specific number of days in each interval, is by using a weighted average of the price and its respective interval

$$W = \frac{a_1d_1 + a_2d_2 + a_3d_3 + a_4d_4}{d_1 + d_2 + d_3 + d_4}$$

$$W = 105$$

$$W = \frac{6000 + 8000 + 8400 + 7200}{280}$$

TABLE 2-1 Weighting an Average

<i>Prices Go</i>		<i>Average during Interval</i>	<i>Total Days for Interval</i>	<i>Weighted</i>	<i>1/a</i>
<i>From</i>	<i>To</i>				
40	80	$a_1 = 60$	$d_1 = 100$	6,000	.01666
80	120	$a_2 = 100$	$d_2 = 80$	8,000	.01000
120	160	$a_3 = 140$	$d_3 = 60$	8,400	.00714
160	200	$a_4 = 180$	$d_4 = 40$	7,200	.00555